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VABILO NA PREDAVANJE
V OKVIRU DOKTORSKEGA ŠTUDIJA
KEMIJSKE ZNANOSTI

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z naslovom:

Bioorganometallic Technetium and Rhenium Chemistry: Theranostics, Fundamentals and Applications

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Vljudno vabljeni!

Povzetek:

The role of metal complexes in pharmaceutical chemistry is still small, despite the success of cisplatin and, more recently, ruthenium-based anti-cancer agents. Equally, technetium-based imaging agents count for the majority of diagnosis in nuclear medicine but their role decreases due to upcoming tools such as positron emission tomography (PET) with ^{18}F, other non-invasive imaging modalities and the lack of new compounds. An analysis of this situation and the future role of metal complexes will be discussed in the presentation. Bioorganometallic chemistry might change this situation since it introduces new concepts in medicinal inorganic chemistry, different from those of applying pure coordination compounds.[1] Organometallic ligands such as cyclopentadienyl or aromatic hydrocarbons may mimic substructures in pharmaceutical compounds and ligands like CO make oxidation states accessible not typical for metals in biological environments.[2] For keeping the role of metals in medicine alive, inorganic complexes must provide an asset over purely organic compounds. That is where theranostics steps in, the combination of therapeutic agents with diagnostic properties, typically found in nanomedicine.[3] Bioorganometallic chemistry with technetium and rhenium offers this opportunity; the combination of therapeutically active but non-radioactive rhenium complexes with technetium homologues for imaging. To arrive at such a combination, in depth knowledge about fundamental reactivities of technetium is mandatory, especially since the ^{99m}Tc complexes have to be prepared in water. The presentation will show examples how to introduce the $[^{99m}Tc(CO)_3]^+$ into therapeutic pharmaceuticals and to prepare their rhenium homologues.[4] The combination of rhenium and ^{99m}Tc in the same complex leads to well-defined clusters, which can be decorated with pharmaceutically active compounds as a first step towards nanomaterials. The $[^{99m}Tc(\eta^6\text{-}C_6H_6)_2]^+$ building block enables in principle the preparation of imaging compounds without bifunctional ligands.[5] Finally, the importance of the cyclopentadienyl ligands will be demonstrated with singly and multiply functionalized cyclopentadiene systems, which are not only useful for technetium or rhenium but also for other metals. It is the objective to show how classical bioorganometallic chemistry with cold elements can learn from imaging concepts and vice versa for the benefit of both fields.

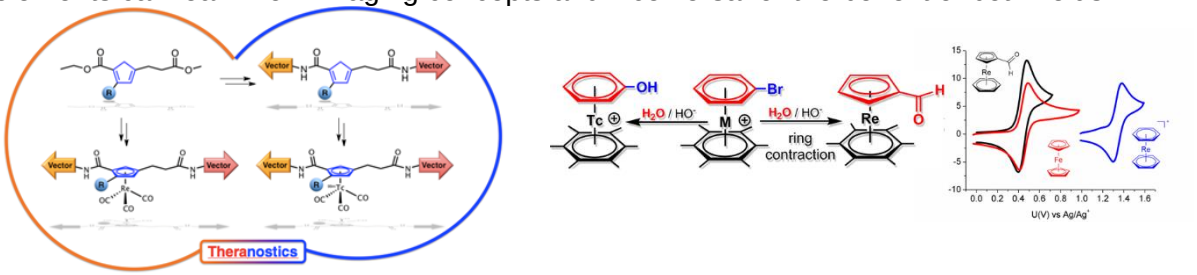

Figure 1. The principle of theranostic application with rhenium and technetium homologues (right) and surprising, fundamental findings when developing new building blocks for application.

[1] E. A. Hillard, G. Jaouen, *Organometallics* **2011**, *30*, 20-27.
[2] S. Imstepf, V. Pierroz, R. Rubbiani, M. Felber, T. Fox, G. Gasser, R. Alberto, *Angew. Chem. Int. Edit.* **2016**, *55*, 2792-2795.
[3] M. Felber, M. Bauwens, J. M. Mateos, S. Imstepf, F. M. Mottaghy, R. Alberto, *Chem. Eur. J.* **2015**, *21*, 6090-6099.
[4] D. Can, B. Spingler, P. Schmutz, F. Mendes, P. Raposinho, C. Fernandes, F. Carta, A. Innocenti, I. Santos, C. T. Supuran, R. Alberto, *Angew. Chem. Int. Edit.* **2012**, *51*, 3354-3357.
[5] M. Benz, H. Braband, P. Schmutz, J. Halter, R. Alberto, *Chem. Sci.* **2015**, *6*, 165-169.